

Jiajia Yu

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Research interests

Overall	Applied and computational math, mathematics of data science/machine learning.
Current focus	mean-field games/control and optimal transport.

Employment

Aug. 2023 – July 2026	Duke University – Durham, NC Phillip Griffiths Assistant Research Professor Mentors: Prof. Hongkai Zhao and Prof. Xiuyuan Cheng
Sept. 2018 – May 2023	Rensselaer Polytechnic Institute – Troy, NY Research Assistant and Teaching Assistant

Education

2018 – 2023	Rensselaer Polytechnic Institute – Troy, NY Ph.D. in Mathematics. <i>GPA: 4/4</i> . Mentor: Prof. Rongjie Lai
2013 – 2017	Beijing Normal University – Beijing, China B.S. in Mathematics and Applied Mathematics. <i>Major GPA: 96/100</i>

Publications

Journal Articles

- [4] **Jiajia Yu**, Quan Xiao, Tianyi Chen, Rongjie Lai, *A Bilevel Optimization Approach for Inverse Mean-Field Games*, Inverse Problems, **40** (2024) 105016 <https://doi.org/10.1088/1361-6420/ad75b0>
- [3] **Jiajia Yu**, Rongjie Lai, Wuchen Li, Stanley Osher, *A Fast Proximal Gradient Method and Convergence Analysis for Dynamic Mean Field Planning*, Mathematics of Computation, 93 (2024), 603-642. <https://doi.org/10.1090/mcom/3879>
- [2] Han Huang, **Jiajia Yu**, Jie Chen, Rongjie Lai, *Bridging Mean-Field Games and Normalizing Flows with Trajectory Regularization*, Journal of Computational Physics, Vol. 487, 112155, 2023. <https://doi.org/10.1016/j.jcp.2023.112155>
- [1] **Jiajia Yu**, Rongjie Lai, Wuchen Li, Stanley Osher, *Computational Mean-field Games on Manifolds*, Journal of Computational Physics, Vol. 484, 112070, 2023. <https://doi.org/10.1016/j.jcp.2023.112070>

Preprints

- [3] **Jiajia Yu**, Xiuyuan Cheng, Jian-Guo Liu, Hongkai Zhao, *Convergence Analysis and Acceleration of Fictitious Play for General Mean-Field Games via Best Response*, arXiv:2411.07989, 2024.

- [2] Yu Liu, Weibin Peng, Tianyu Wang, **Jiajia Yu**, *Zeroth-order Stochastic Cubic Newton Method with Low-rank Hessian Estimation*, arXiv:2410.22357, 2024. (Submitted)
- [1] Tianyu Wang, Zicheng Wang, **Jiajia Yu**, *Zeroth-order Low-rank Hessian Estimation via Matrix Recovery*, arXiv:2402.05385, 2024. (Submitted)

Awards

- 2024 **SIAM Early Career Travel Award**, MDS24, SIAM
- 2023 **Karen and Lester Gerhardt Prize**, School of Science, RPI
- 2023 **Joaquin B. Diaz Memorial Prize**, Department of Mathematical Sciences, RPI
- 2022 **AWM Travel Grant**, AWM

Professional Services

Conference Organization

- Oct. 2024 Mini-symposium at SIAM MDS24, Atlanta, GA.
Incorporating Optimal Transport in Machine Learning, co-organize with Alex Cloninger (UCSD).
- Oct. 2023 Mini-symposium at SIAM NYNJPA 1st Annual Meeting, NJIT, Newark, NJ.
Optimal Transport: Computation, Applications, and Extensions, co-organize with Rongjie Lai (Purdue).

Journal/Book/Conference Referee

Journal of Computational Physics.

Association for Women in Mathematics Spring Series (Advances in Data Science).

Presentations

Invited Seminar Talks

- Oct. 2023 Computational mean-field games: from conventional methods to deep generative models
IMA Data Science Seminar, University of Minnesota, Minneapolis, MN.
- Oct. 2023 A bilevel optimization approach for inverse mean-field games
RTG Seminar, University of South Carolina, Columbia, SC.
- July 2023 Computational mean-field games: from conventional methods to deep generative models
(Virtual) *Summer School on Mathematical Foundation of Data Science*, University of South Carolina.
- June 2022 Computational mean-field games on manifolds
(Virtual) *Optimal Transport and Mean-Field Games Seminar*, University of South Carolina.
- March 2021 An efficient and flexible algorithm for dynamic mean-field planning and convergence analysis
(Virtual) *Optimal Transport and Mean-Field Games Seminar*, University of South Carolina.

Invited Workshop/Workshop Talks

- Aug. 2024 Computational methods for the mean-field game and its inverse game
Theory and Applications for Optimal Control and Generative Models, Purdue University, West Lafayette, IN.
- July 2024 *Empowering a Diverse Computational Mathematics Research Community*, ICERM, Providence, RI.
- May. 2023 *AMS MRC Conference: Ricci Curvatures of Graphs and Applications to Data Science*, Beaver Hollow Conference Center, Java Center, NY.

Conference Talks

- Oct. 2024 Computational methods for inverse mean-field games
SIAM MDS24, Atlanta, GA.
- May. 2023 A bilevel optimization approach for inverse mean-field games
SIAM IS24, Atlanta, GA.
- Oct. 2023 Computational mean-field games on manifolds
Optimal Transport: Computation, Applications, and Extensions, SIAM NYNJPA 1st Annual Meeting, New Jersey Institute of Technology, Newark, NJ.
- Aug. 2023 A bilevel optimization approach for inverse mean-field games
Optimization in Machine Learning, Conference on Modeling and Optimization: Theory and Applications (MOPTA), Lehigh University, Bethlehem, PA.

Posters

- Nov. 2023 A bilevel optimization approach for inverse mean-field games
Triangle Computational and Applied Mathematics Symposium, Duke University, Durham, NC.
- June 2022 Computational mean-field games on Euclidean space and manifolds
The 2022 AWM Research Symposium Poster Session, University of Minnesota, Minneapolis, MN.

Teaching

Instructor, Duke University, Durham, NC

- 2024S, 2025S Math 466/766 Mathematics of Machine Learning
- 2023F, 2024F Math 465/765 Introduction to High-Dimensional Data Analysis
(2023F co-teach with Prof. Xiuyuan Cheng)

Teaching Assistant, Rensselaer Polytechnic Institute, Troy, NY

- 2019F MATH 4400 ODE and Dynamical Systems, Instructor: Prof. Gregor Kovačič
- 2019F MATH 4200 Mathematical Analysis I, Instructor: Prof. Bruce Piper
- 2019S MATH 4020 Introduction to Number Theory, Instructor: Prof. Bruce Piper
- 2018F MATH 4200 Mathematical Analysis I, Instructor: Prof. Fengyan Li
- 2018F MATH 4040 Introduction to Topology, Instructor: Prof. Bruce Piper

Outreach

- 2022 – 2023 Vice President of AWM Student Chapter at RPI